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Intravital Imaging Study on Photodamage Produced by Femtosecond Near-infrared Laser Pulses in Vivo

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Abstract

© 2016 The American Society of Photobiology.Ultrashort femtosecond pulsed lasers may provide indispensable benefits for medical bioimaging and diagnosis, particularly for noninvasive biopsy. However, the ability of femtosecond laser irradiation to produce biodamage in the living body is still a concern. To solve this biosafety issue, results of theoretical estimations as well as the in vitro and in situ experiments on femtosecond biodamage should be verified by experimental studies conducted in vivo. Here, we analyzed photodamage produced by femtosecond (19, 42 and 100 fs) near-infrared (NIR; ~800 nm) laser pulses with an average power of 5 and 15 mW in living undissected Drosophila larvae (in vivo). These experimental data on photodamage in vivo agree with the results of theoretical modeling of other groups. Femtosecond NIR laser pulses may affect the concentration of fluorescent biomolecules localized in mitochondria of the cells of living undissected Drosophila larva. Our findings confirm that the results of the mathematical models of femtosecond laser ionization process in living tissues may have a practical value for development of noninvasive biopsy based on the use of femtosecond pulses.

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